

REMARKS

Claim 1 has been amended to recite that “x and y are independently selected and each is a number from about 0 to about 100, but x and y cannot both be 0.” Support for this amendment is found in the as-filed specification at least at page 4, lines 8-11. Claims 13 and 14 have been amended to improve antecedent basis. Claim 32 has been amended to improve clarity and form and to recite that “x and y are also independent independently selected and each is a number from 0 to about 100, but cannot both be 0.” Support for this amendment is found in the as-filed specification at least at page 4, lines 8-11. Claims 33 through 39 and 48 have each been amended to improve antecedent basis. Claims 60 and 61 have been amended to improve antecedent basis. Claim 62 has been amended to improve clarity and form. Claim 63 has been amended to recite “quaternizing the terminal amino groups to render the conjugated cationic polymer soluble in water.” Claim 65 has been amended to recite “quaternizing the terminal amino groups to an extent necessary to provide solubility of the conjugated cationic polymer in at least one of dimethyl sulfoxide, methanol, and water.” Support for the amendments to claims 63 and 65 is found in the as-filed specification at least at page 12, line 24 to page 13, line 2. Support for new claims 66 and 67 is found in originally-filed claim 1. No new matter has been added.

The Office Action mailed June 19, 2008, has been received and reviewed. Claims 1 through 21, 32 through 42, 47 through 53, and 60 through 65 are currently pending and under consideration in the application. Claims 1 through 21, 32 through 42, 47 through 53, and 60 through 65 stand rejected.

Applicants have amended claims 1, 13, 14, 32 through 39, 48, 60 through 63 and 65, have added new claims 66 and 67, and respectfully request reconsideration of the application as amended herein.

Claim Objections

Claims 47 through 52 are objected to under 37 C.F.R. § 1.75(c) as being of improper dependent form for allegedly failing to further limit the subject matter of a previous claim.

The rejection of claim 47 is moot, since claim 47 has been canceled herein.

Claim 48 has been amended to depend from independent claim 1.

Claims 32 through 42, 64 and 65 are objected to due to informalities in the claim language. The objection to claim 64 is moot, as this claim has been canceled. In light of the amendments to claims 32 through 42 and 65, the objections should be withdrawn.

Claim 64 was also objected to under 37 C.F.R. § 1.75(c) as being of improper dependent form for allegedly failing to further limit the subject matter of a previous claim. Claim 64 has been canceled herein, rendering this objection moot.

35 U.S.C. § 112 Claim Rejections

Claims 1 through 21, 32 through 42, 47 through 53, and 60 through 65 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants respectfully traverse this rejection, as hereinafter set forth.

With respect to claims 1 through 21 and 48 through 53, it is asserted in the Office Action that C and D could not be hydrogen as C and D are depicted as divalent in the formula shown in claim 1. *See* Office Action, page 3. Independent claim 1 has been amended to recite that “C and D are identical or different and are each O, S, CO, COO, CRR’, NR’, SiR’R’,” thus overcoming the rejection of claims 1 through 21 and 48 through 53.

The rejection of claim 47 is moot, as claim 47 has been canceled herein.

Claims 32 through 42 and 60 through 65 have been rejection for substantially the same reasons as claims 1 through 21 and 47 through 53. *Id.* Claim 32 has been amended to recite “C and D are identical or different and are each O, S, CO, COO, CRR’, NR’, SiR’R’,” thus overcoming the rejection.

It is further asserted that claim 2 is indefinite as being drawn to a homopolymer. *Id.* Specifically, it is asserted in the Office Action that claim 1, from which claim 2 depends, must contain two different units (x and y must be at least one). *Id.* However, as amended herein, claim 1 recites that “x and y are independently selected and each is a number from 0 to about 100,” thus overcoming the rejection.

Claims 60 through 63 are further rejected as it is asserted that it is not clear if the method of claim 32 further comprises the steps of claim 60 or if claim 60 is a distinct process. *See* Office Action, page 4. It is noted that independent claim 32 recites the element of “providing a

conjugated polymer,” the formula of which is recited therein. Claim 60, as amended herein, which depends directly from claim 32, recites that “providing a conjugated polymer comprises: providing monomer precursors of the conjugated polymer; quaternizing terminal amino groups of the monomer precursors; and synthesizing the conjugated polymer from the quaternized monomer precursors.” It is respectfully submitted that one of ordinary skill in the art would understand that claim 60 further limits the recited element of claim 32. Therefore, amended claim 60 properly limits claim 32.

It is further asserted that antecedent basis has not been provided for the element of “quaternizing terminal amino groups” in claim 60. *Id.* Claim 60 has been amended to recite “providing monomer precursors of the conjugated polymer, the monomer precursors comprising the terminal amino groups,” thus overcoming the rejection.

With respect to claims 62, 63, and 65, it is asserted that the term “desired solubility” is indefinite. In view of the amendments to claims 62, 63, and 65, it is believed that the rejection have been overcome.

The rejection of claim 64 is moot, as claim 64 has been canceled.

Accordingly, withdrawal of the rejections of claims 1 through 21, 32 through 42, 48 through 53, and 60 through 65 under 35 U.S.C. § 112, second paragraph, is respectfully requested.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on Liu et al., *Synthesis Of A Novel Cationic Water-Soluble Efficient Blue Photoluminescent Conjugated Polymer*, Chem. Commun., 2000, Pages 551-552; in View of Rau et al., *Towards Rigid-Rod Polyelectrolytes via Well Defined Precursor Poly(para-phenylene)s Substituted by 6-Iodohexyl Side Chains*, Acta Polymer, Vol. 45, Pages 3-13, 1994; and U.S. Patent Publication No. 2002/0013451 to Huang et al.

Claims 1, 3 through 5, and 7 through 21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Synthesis Of A Novel Cationic Water-Soluble Efficient Blue Photoluminescent Conjugated Polymer*, Chem. Commun., 2000, Pages 551-552, by Liu et al. (hereinafter “Liu”), in view of *Towards Rigid-Rod Polyelectrolytes Via Well Defined Precursor Poly(para-phenylene)s Substituted by 6-Iodohexyl Side Chains*, Acta Polymer, Vol. 45, Pages 3-13, 1994, by Rau et al.

(hereinafter “Rau”), and U.S. Patent Publication No. 2002/0013451 to Huang *et al.* (hereinafter “Huang”). Applicants respectfully traverse this rejection, as hereinafter set forth.

To establish a *prima facie* case of obviousness the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 985 (CCPA 1974); *see also* MPEP § 2143.03. Additionally, the Examiner must determine whether there is “an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740-1741, 167 L.Ed.2d 705, 75 USLW 4289, 82 U.S.P.Q.2d 1385 (2007). Further, rejections on obviousness grounds “cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *Id* at 1741, quoting *In re Kahn*, 441, F.3d 977, 988 (Fed. Cir. 2006). Finally, to establish a *prima facie* case of obviousness there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Furthermore, the reason that would have prompted the combination and the reasonable expectation of success must be found in the prior art, common knowledge, or the nature of the problem itself, and not based on the Applicant’s disclosure. *DyStar Textilfarben GmbH & Co. Deutschland KG v. C. H. Patrick Co.*, 464 F.3d 1356, 1367 (Fed. Cir. 2006); MPEP § 2144. Underlying the obvious determination is the fact that statutorily prohibited hindsight cannot be used. *KSR*, 127 S.Ct. at 1742; *DyStar*, 464 F.3d at 1367.

It is noted that “[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue known options within his or her technical grasp.” *KSR* at 1742. In *Ortho-McNeil Pharmaceutical, Inc. v. Mylan Laboratories, Inc.*, 520 F.3d 1358, 1364 (Fed. Cir. 2008), the Federal Circuit explained that “[t]he passage above in *KSR* posits a situation with a finite, and in the context of the art, small or easily traversed, number of options that would convince an ordinary skilled artisan of obviousness.” The Federal Circuit has further stated that “[t]o the extent an art is unpredictable, as the chemical arts often are, *KSR*’s focus on the ‘identified, predictable solutions’ may present a difficult hurdle because potential solutions are less likely to be genuinely predictable.” *Eisai v. Dr. Reddy’s Laboratories and Teva Pharmaceuticals*, 87 USPQ.2d 1452, 1457 (Fed Cir. 2008).

A *prima facie* case of obviousness under 35 U.S.C. § 103(a) cannot be established against claims 1, 3 through 5, and 7 through 21 because the applied references do not teach or suggest each and every claim limitation and, in addition, one of ordinary skill in the art would not have had a reason to combine the applied references in the asserted manner.

Liu teaches the cationic conjugated polymer poly[(9,9-dihexyl-2,7,-fluorene)-*alt-co*-(2,5-bis{3-[*N,N*-dimethyl]-*N*-ethylammonium-1-oxapropyl}-1,4-phenylene)] dibromide. *See* Abstract. The cationic conjugated polymer is water-soluble and emits an intense blue fluorescence. *Id.* at page 552, column 2.

Rau teaches a Pd-catalyzed poly-condensation method for forming poly(*para*-phenylene) derivatives including 6-phenoxyhexyl side chains. *Id.* at page 8.

Huang teaches electroluminescent conjugated polymers including a backbone of alternated fluorene and phenylene units. *See* Abstract. The polymers of Huang are soluble in common organic solvents and emit blue light in film states. *Id.*

With respect to claim 1, it is acknowledged in the Office Action that Liu does not teach or suggest a fluorene having alkyl chains that include a heteratom. *See* Office Action, page 6. Therefore, the Examiner relies on Huang as teaching a substituted fluorene-phenylene copolymer with alkoxy substituents. *Id.* It is asserted in the Office Action that “[i]t would have been obvious to a person having ordinary skill in the art at the time of invention to have used the alkoxy substituents of Huang et al. in the place of the alkyl substituents of Liu et al. . . . to control the solubility and electronic tenability of the polymer.” *Id.* Although Huang teaches attachment of different functional groups, i.e., R₁ and R₂, on the 9-position of a fluorene ring in a conjugated polymer, such functional groups are “selected from the group consisting of H, a (C₁-C₂₂) linear or branched alkyl, alkoxy or oligo (oxyethylene) group, a (C₆-C₃₀) cycloalkyl group, and an unsubstituted or substituted aryl group.” *Huang* at paragraph [0026]. Therefore, contrary to the Examiner’s assertion, Huang does not present a finite (and small in the context of the art) number of options as substituents of the 9-position of the fluorene ring. Moreover, Huang teaches 9,9-dialkylfluorene-2,7-bis(trimethylene boronate), 2,7-dibromo-9,9-dioctylfluorene, and 2,7-dibromo-9,9-dihexylfluorene as specific examples of monomers. Huang further states that “[p]referably, dialkyl chains are attached at the 9-position of the fluorene ring.” *Id.* It is, therefore, respectfully submitted that Huang expressly discourages the use of alkoxy groups at the 9-position of the

fluorene ring. Thus, one of ordinary skill in the art would not have been likely to select an alkoxy group for R₁ and R₂ among the various other unpredictable alternatives of Huang. Because one of ordinary skill in the art would not have found the substitution of the R₁ and R₂ groups of Huang with the compound of Liu predictable, the conjugated polymer of claim 1 is not obvious in view of Liu and Huang.

Claims 3 through 5, and 7 through 21 are each allowable, *inter alia*, as depending from an allowable base claim.

Obviousness Rejection Based on Liu, in View of Rau and Huang, and Further in View of International Patent Publication No. WO 99/54385 to Woo *et al.*

Claim 6 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu, in view of Rau and Huang, as applied to claim 1 above, and further in view of International Patent Publication No. WO 99/54385 to Woo *et al.* (hereinafter "Woo").

Claim 6 is allowable, *inter alia*, as depending from an allowable base claim.

Obviousness Rejection Based on Liu, in View of Rau and Huang

Claims 32 through 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu, in view of Rau and Huang. Applicants respectfully traverse this rejection, as hereinafter set forth.

It is respectfully submitted that a *prima facie* case of obviousness cannot be established against claims 32 through 39 because one of ordinary skill in the art would not have had a reason to combine the applied references in the asserted manner.

The teachings of Liu, Rau and Huang are as previously discussed.

It is respectfully submitted that amended independent claim 32 would not have been obvious to one of ordinary skill in the art for substantially the same reasons discussed above with respect to claim 1.

Since one of ordinary skill in the art would not have been motivated to combine the references in the manner asserted, withdrawal of the 35 U.S.C. § 103(a) rejections of claims 32 through 39 is respectfully requested.

Obviousness Rejection Based on Liu, in View of Rau and Huang, and Further in View of International Patent Publication No. WO 00/60612 to Ho *et al.*

Claims 40 through 42 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu, in view of Rau and Huang, as applied to claim 36 above, and further in view of International Patent Publication No. WO 00/60612 to Ho *et al.* (hereinafter “Ho”).

Each of claims 40 through 42 is allowable, *inter alia*, as depending from an allowable base claim.

Obviousness Rejection Based on Liu, in View of Rau and Huang

Claims 47 through 53, 64, and 65 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu, in view of Rau and Huang. Applicants respectfully traverse this rejection, as hereinafter set forth.

It is respectfully submitted that amended independent claim 47 would not have been obvious to one of ordinary skill in the art for substantially the same reasons discussed above with respect to claim 1.

Each of claims 48 through 53, 64 and 65 are each allowable, *inter alia*, as depending from an allowable base claim.

Obviousness Rejection Based on Liu

Claims 60 through 63 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu.

Claims 60 through 63 are each allowable, *inter alia*, as depending from an allowable base claim.

It is, therefore, respectfully requested that the rejections of claims 1 through 21, 32 through 42, 48 through 52, and 60 through 65 under 35 U.S.C. § 103(a) be withdrawn, and that each of these claims be allowed.

Double Patenting Objections

The Examiner states that if claim 62 is found allowable, claim 63 will be objected to under 37 C.F.R. 1.75 as being a substantial duplicate thereof, and that if claim 32 is found allowable, claim 64 will be objected to under 37 C.F.R. 1.75 as being a substantial duplicate thereof.

In view of the amendments to claims 62 and 63, it is respectfully submitted that this objection has been overcome.

Claim 64 has been canceled, rendering the double patenting objection thereof moot.

Accordingly, withdrawal of the objections of each of claims 32, 62, and 63 under 37 C.F.R. 1.75 is respectfully requested, as is the allowance of each of these claims.

New Claims

New independent claim 66 is allowable for substantially the same reasons as claim 1. New independent claim 67 defines subject matter that is patentable over the references relied upon in making the rejections described in the Office Action. Specifically, none of the applied references teaches or suggests a conjugated polymer having the formula recited in claim 67 wherein "C and D are identical or different and are each S, CO, COO, CRR', NR', or SiR'R'."

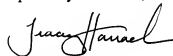
ENTRY OF AMENDMENTS

The amendments to claims 11, 13, 14, 32 through 39, 48, 60 through 63 and 65, and new claims 66 and 67, above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application.

CONCLUSION

Claims 1 through 21, 32 through 42, 48 through 53, and 60 through 67 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, the Examiner is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,



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Date: December 16, 2008
KAH:TH/nj:ec
Document in ProLaw